

A MONOGRAPH OF THE GENUS *PLATYDESMA* (RUTACEAE)¹BENJAMIN C. STONE²

THE GENUS *PLATYDESMA* was described by Horace Mann, Jr. (1866), to accommodate an unusual rutaceous species collected by him and William Brigham "on the mountains behind Honolulu" on the island of Oahu in the Hawaiian Islands. Mann presented a rather full description of the genus and its single species, which he named *Platydesma campanulata*. A few years later (1869) he again wrote of the genus and species, with almost unchanged descriptions, but added a few sentences pertaining to the circumstances of the discovery, and a fine full-page half-tone plate illustrating its habit and flowers. The species was noted by Heinrich Wawra (1873) without further description or commentary. In 1888, however, Wilhelm Hillebrand, in his great *Flora of the Hawaiian Islands*, added three species to the genus, two of them, *P. cornuta* and *P. rostrata*, described as new, and a third to which Hillebrand applied the name *P. auriculaefolia*, based on *Pelea auriculaefolia* A. Gray. As has previously been pointed out (Rock 1913, 1918; Stone 1961, 1962), Hillebrand erred in considering Gray's species to be a *Platydesma*, for it is a true *Pelea* of the typical section. However, the specimens which led Hillebrand to include a fourth species in *Platydesma* are, in fact, members of the genus. Rock (1913) named the taxon represented by these specimens *Platydesma campanulatum* var. *sessilifolia* (sic). This taxon is here considered to be of specific rank, agreeing essentially with Hillebrand's treatment, but clearly less distinct from *P. spathulatum* (the correct name of Mann's *P. campanulata*) than either *P. cornutum* or *P. rostratum* which Hillebrand first described.

¹ Studies in the Hawaiian Rutaceae, VI.

² The field work for this revision was accomplished while the writer was Research Assistant, Department of Botany, University of Hawaii, Honolulu. Some studies of borrowed herbarium specimens were performed at the Herbarium, Department of Botany, U. S. National Museum, Washington, D. C. I am grateful to the officers of several institutions for making the material available. These include: Sir George Taylor, Royal Botanic Gardens, Kew; Dr. J. E. Dandy, British Museum (Natural History); Dr. Bertil Lindquist, Göteborg Botanical Garden; Dr. R. T. Clausen, Herbarium, Department of Botany, Cornell University; Dr. Alicia Lourteig, Mme. Tardieu-Blot, and Dr. J. Léandri, of the Laboratoire de Phanérogamie, Muséum National d'Histoire Naturelle, Paris; and Dr. Otto Degener, Waialua, Oahu, Hawaii, who supplied both herbarium material and fresh collections. I also wish to thank Dr. L. B. Smith of the U. S. National Museum for his kind assistance. At the Bishop Museum, Honolulu, where a rather large number of collections of the various species has been accumulating, I was provided with all necessary facilities for study. I am much indebted to Marie C. Neal and to E. H. Bryan, Jr., of the Museum staff, for their assistance and encouragement. At Harvard, Dr. R. A. Howard and Dr. L. M. Perry provided generous assistance in my studies of the materials in the herbarium of the Arnold Arboretum and of the Gray Herbarium, for which I am most grateful.

The name now applied to this species has a curious history. Material collected by Jules Remy was provisionally determined by H. Baillon in Paris as *Claoxylon insigne* sp. nov. (*Claoxylon* is a genus of Euphorbiaceae, the fruits of which [in the Hawaiian species] bear a slight resemblance to those of *Platydesma*.) Remy's specimen bears only fruit. The name *C. insigne* was never validly published, but was listed (without description and only a herbarium reference) by Drake del Castillo (1890). Many years later, while revising the Hawaiian members of *Claoxylon*, E. E. Sherff happened to see the Remy collection and, relying all too heavily on the authority of Baillon, published the name *Claoxylon Remyi* Sherff sp. nov., with a full description. Recently the real identity of this "Claoxylon" became apparent to Dr. Otto Degener, who received confirmation from the Muséum National d'Histoire Naturelle of Paris that the plant was rutaceous. A lifelike drawing of the specimen was prepared (see FIG. 4) in which the character of *Platydesma* may readily be seen. The proper transfer of the name was made in Degener's *Flora Hawaiiensis* (1960), where the present writer was able to show that this species is identical with the one intended by Hillebrand to include his specimens from Kohala, Hawaii, to which he had appended the name *Platydesma auriculaefolia*. The species is now called *Platydesma Remyi* (Sherff) Deg., Sherff & Stone.

Only two other names must be considered in the genus, both published by H. Lévillé, whose erratic work, discussed at some length both by Rock and Rehder in recent years, scarcely needs further mention. The first is *Platydesma oahuensis* Lévl. (1911), which is simply a synonym of Mann's original species. The second, *Platydesma Fauriei* Lévl. (1911) is borne by a plant not a member of the Rutaceae, but of the Solanaceae, *Nothocestrum longifolium* A. Gray, as was first pointed out by Rock (1914).

Recently it was found necessary to take up an older specific epithet for Mann's original species (Stone, 1962), which must now be called *Platydesma spathulatum* (A. Gray) Stone. The basionym is *Melicope spathulata* A. Gray, published a decade earlier than Mann's species. Gray also described *Melicope ? grandifolia* in the same work (1854), which is the same species. Photographs of the type specimens were published in a preceding paper (Stone, 1962).

Platydesma H. Mann,³ Proc. Boston Soc. Nat. Hist. 10: 317. 1866; Mem. Boston Soc. Nat. Hist. 1: 529. 1869. Hillebrand, Fl. Hawaiian Is. 71. 1888. Rock, Indig. Trees Hawaiian Is. 241. 1913. Engler, Nat. Pflanzenfam. ed. 2. 19a: 240, fig. 101, A-G. 1931.

Shrubs or small trees with opposite or subopposite, simple, punctate,

³ Mann attributed feminine gender to the generic name, and was followed in this usage by most later authors. The name, however, like several others taken from Greek (such as *Geniostoma*) is of a class which, although ending in the apparently Latin feminine *-a*, takes neuter modifiers. Therefore the specific and varietal epithets are corrected, where necessary, to neuter gender.

elongate, nonstipulate leaves; wood when freshly broken with a pepsin-like odor, somewhat brittle; inflorescences axillary, cymose or subsessile and contracted; flowers hermaphrodite, with 4 broad, rounded sepals in imbricated pairs; petals 4, white, but slightly imbricated; disk plane, obscurely 4-8-lobate; stamens 8, connate into a staminal tube, white, only the anthers and a short, broad, deltoid filament (adnate to the connective) free, the anthers narrow, elongate, subhastate at the base, with linear thecae; ovary of 4 carpels, rounded above, adnate to the apex, each with 5-8 pendulous ovules on short, broad funiculi; style central, of 4 connate elements, columnar, the linear, erect, united stigmas somewhat thickened at apex; fruit capsular, dry, 4-lobed, the carpels remaining connate, loculicidally (sometimes tardily) dehiscent, rounded or horned at apex, the endocarp thin, glabrous, finally separable, the seeds subovoid or ellipsoid with angles and faces (if any) from mutual pressures, the testa black and shining, the wall osseous, the cotyledons of the embryo thin, broad, rounded, the hypocotyl very short, the embryo enclosed by endosperm.

TYPE SPECIES: *Platydesma campanulatum* H. Mann = *P. spathulatum* (A. Gray) Stone.

DISTRIBUTION: Endemic to the Hawaiian Islands; four species: *Platydesma spathulatum*, widespread in the archipelago, with insular varieties and forms; *P. cornutum*, endemic to Oahu; *P. rostratum*, endemic to Kauai; and *P. Remyi*, apparently endemic to the Kohala Mountains, Hawaii.

RELATIONSHIPS: *Platydesma* is placed by Engler in the subfamily Rutoideae, tribe Xanthoxyleae, subtribe Choisyinae, as genus 28 between *Choisya* HBK., a Mexican and southwestern American genus, and *Dutailleya* Baill., a small genus of two species endemic to New Caledonia. Neither of these genera, however, appears to be either very close in relationship or similar in superficial or technical characters. *Medicosma* Hook. f., a monotypic Australian genus, is closer in appearance, and possibly in affinity, although placed before (as genus 25) the above-mentioned genera. It is perhaps more plausible to consider that *Platydesma* may be ultimately an Old World derivative, but to exclude American affinities would be premature.

ECOLOGY: *Platydesma spathulatum*, and its subtaxa, are both more common and more widely distributed in the Hawaiian group than the other species. None, however, could be considered dominant or even frequent members of the vegetation. The species are to be found chiefly in the rainforests at moderate elevations, from roughly 2000 to 5000 feet, and also on windswept crests in low, stunted vegetation. *Platydesma cornutum* and *P. rostratum* usually occur as single plants or in small groups, often along streams or gullies under heavy shade, while *P. spathulatum* may be found under open or closed canopy forests, or exposed on slopes, and can apparently tolerate drier situations. In a few localities

(such as around Kokee, Kauai) *P. spathulatum* may be found so frequently as to constitute a considerable, though never dominant, component of the association.

HABIT: *Platydesma spathulatum* is a polymorphic species, but older individuals in more protected areas become small trees. In forests such as those about Kumuwela, Kauai, trees of five to eight meters in height form an understory in a forest containing species of *Psychotria*, *Pelea*, *Bobea*, *Pleomele*, *Pritchardia*, and other genera. In exposed, windswept areas such as open crests along the Koolau Range, Oahu, a form of the same species may be found occurring as a small shrub. Both *Platydesma cornutum* and *P. rostratum* are shrubby, with erect, usually slender stems and erect or ascending branches. They can accurately be called "Schopfbäume" with their rather large leaves clustered toward the ends of the branches (see FIG. 1). *Platydesma Remyi* has the habit of *P. spathulatum*.

LOCAL NAME AND USE: The Hawaiian name for all species is "Pilo kea," meaning "white pilo." If the Hawaiians had a particular use for the plant, it is not presently known. Certain species have recently been the subject of chemical investigations by P. J. Scheuer and his associates at the University of Hawaii. Evidence has been found that some species contain appreciable amounts of alkaloids and essential oils. In this connection, it is worthy of note that Rock (Indig. Trees 242. 1913) reported that the odor of the plant when bruised is like pepsin. The wood, when broken, emits a starchy odor.

SPECIFIC CHARACTERS: Characters of taxonomic value are found chiefly in the structure, shape, and size and presence or absence of indument of the fruits; the structure of the inflorescence; the shape and size of the leaf, especially the petiole; the habit; and, to a lesser extent, the amount of pubescence both on leaves and parts of the inflorescence. The other indigenous genera of Rutaceae, *Fagara* (*Zanthoxylum*) and *Pelea*, are greatly different both in appearance and in technical characters, although seedling stages of *Pelea* and *Platydesma* could perhaps be confused with one another.

KEY TO THE SPECIES

1. Carpels in fruit rounded, the capsule subglobose; habit shrubby or usually arborescent, small trees with several to many irregularly arranged spreading or ascending branches. Section PLATYDESMA.
 2. Petioles conspicuous, 1-6 cm. long; fruits glabrous, Kauai, Oahu, Maui, Hawaii (probably also Molokai). 1. *P. spathulatum*.
 2. Petioles obsolete or at most 5 mm. long, flattened; fruits with a more or less persistent minute pubescence; Hawaii. 2. *P. Remyi*.
1. Carpels in fruit rostrate, cornute, or sharply pointed, and somewhat divaricate; habit shrubby, with erect, sparsely branched or simple stems closely foliose toward the apices. Section CORNUTIA.
 3. Carpels in fruit conic-pointed or shortly attenuate; leaves elongate, spath-

- ulate, narrowed at base to a small rounded or decurrent lamina; Oahu.
 3. *P. cornutum*.
 3. Carpels in fruit tapered into a slender, elongate beak; leaves narrowly
 oblong or subspathulate, the base broad and abruptly truncate or obtuse;
 Kauai. 4. *P. rostratum*.

Section PLATYDESMA

1. *Platydesma spathulatum* (A. Gray) B. C. Stone, Madroño 16: 165.
 1962.

Melicope spathulata A. Gray, Bot. U. S. Expl. Exped. 15: 352. 1854.

Melicope? grandifolia A. Gray, *op. cit.* 354.

Platydesma campanulata H. Mann, Proc. Boston Soc. Nat. Hist. 10: 317. 1866;
 Mem. Boston Soc. Nat. Hist. 1: 529–531. *pl.* 22. 1869. Hillebrand, Fl.
 Hawaiian Is. 71. 1888, "*campanulata*." Heller, Minn. Bot. Stud. 1: 841.
 1897. Rock, Indig. Trees Hawaiian Is. 241. 1913 (including f. *coriaceum*).
 Skottsberg, Acta Horti Gothob. 10: 120. 1936; *ibid.* 15: 388. 1944.

Platydesma campanulata γ var. *macrophylla* Hillebrand, *loc. cit.*

Platydesma oahuensis Léveillé, Rep. Sp. Nov. 10: 153. 1911.

A shrub or small tree to about 12 m., with spreading branches foliose toward the ends, trunk straight, to about 20 cm. thick, glabrous throughout or with fulvous pubescence on the new leaves and inflorescence (and in some varieties the mature leaves pubescent beneath); juvenile branches greenish, at last clothed with pale grayish bark; all parts copiously glandular, emitting odor of pepsin; wood, when broken, with a starchy odor; leaves variable in size, distinctly petiolate, the petiole 10–60 mm. long, the blades usually 10–50 cm. long (sometimes less), 5–20 cm. wide (sometimes less), spathulate, lanceolate, obovate-lanceolate, or sometimes elliptic, generally about 2.5 to 4.5 times longer than broad, coriaceous or thickly so, sometimes the margins revolute, rounded to obtuse, acute, or even slightly acuminate at apex, rounded, obtuse, or acute at base, entire, moderately to very dark green above, usually paler beneath, pinnately veined, the lateral nerves subopposite, ascending from the dorsally prominent ventrally sulcate costa, straight for about $\frac{3}{4}$ their length, thereafter dividing but not uniting into a distinct marginal vein; inflorescences axillary, initiated among the leaves, pedunculate, cymose, usually 3–5-flowered; peduncles about as long as the petioles, nodose, with ovate-subulate or narrowly deltoid acute bracts; pedicels up to 1 cm. long, bracteolate; flowers about 15–20 mm. long, the 4 calyx lobes imbricate in pairs, green, glabrous except for the ciliolate margins, or sparsely to densely puberulent with appressed hairs, ovate-orbicular, about 8–10 mm. long, minutely carinate apically without, more or less persistent into fruiting; petals 4, clear somewhat creamy white, somewhat (never widely) spreading at anthesis, slightly obovate-oblong to ovate-oblong, minutely thickened unguiculate within at apex, sometimes obscurely emarginate and mucronulate in the notch, about 14–21 mm. long; stamens 8, united into a tube, white, the tube 12–13 mm. long, the anthers connivent on short deltoid oblong processes adnate to the connective; ovary 4-locular,

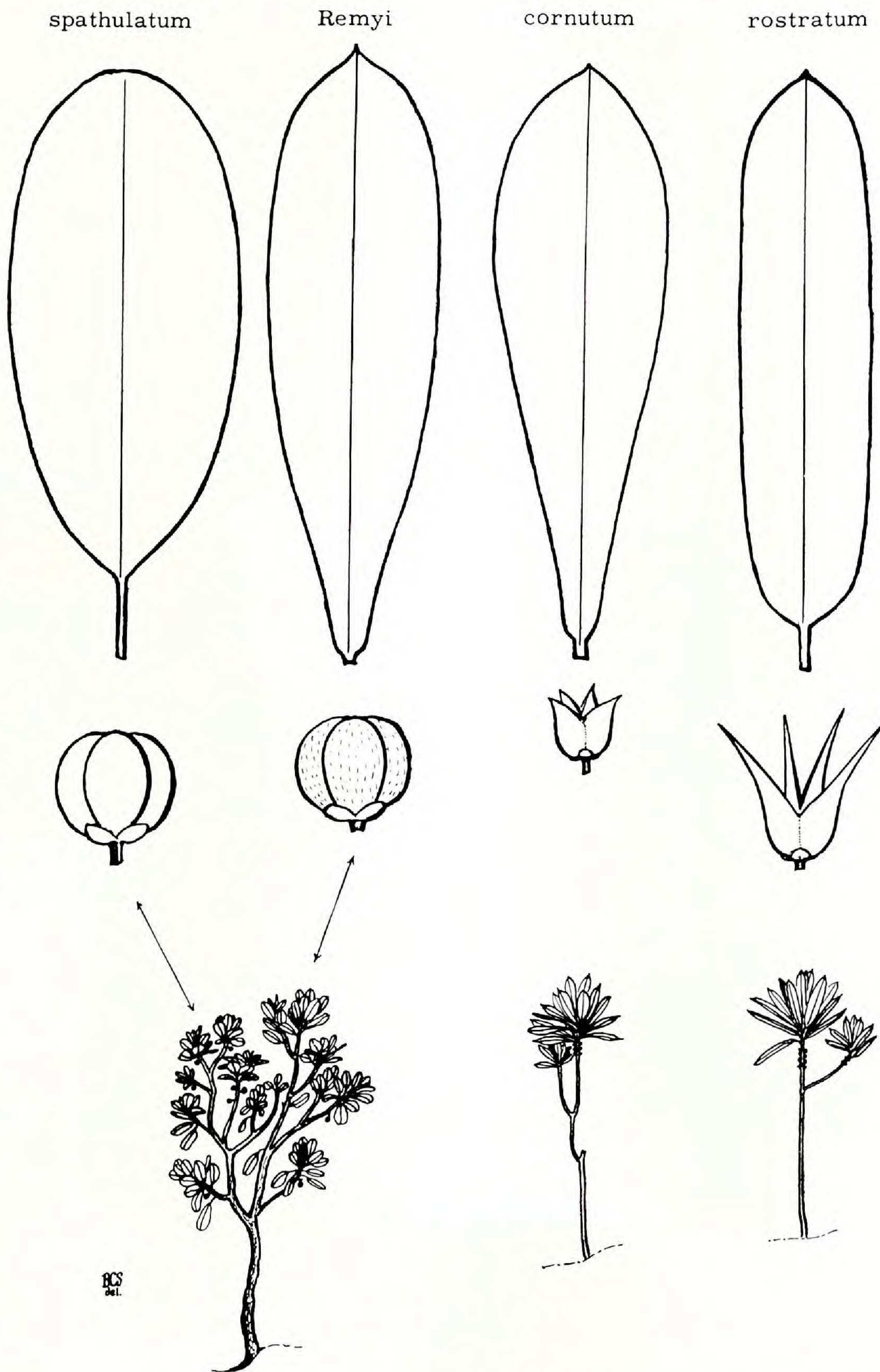


FIG. 1. Leaves, fruits, and habit sketches of the four species of *Platydesma*; semi-diagrammatic.

4-lobed, at first minutely puberulous; style about 9 mm. long, whitish, slightly clavate and greenish at apex, with linear stigmas; fruit globose, slightly 4-lobed, to 26 mm. in diameter, the carpels adnate to the summit, in age slightly separating laterally, at last dehiscent; seeds 5–8 per locule, with a shining black testa, attached by short funicles to the glabrous endocarp.

HOLOTYPE: United States Exploring Expedition, 1838–1842, island of Kauai (US) (*Melicope spathulata* A. Gray).

KEY TO SUBTAXA OF *PLATYDESMATA SPATHULATUM*

1. Calyx glabrous or very sparsely puberulent only at extreme base.
 2. Leaves glabrous beneath.
 3. Petioles slender, elongate, usually 2–6 cm. long; blades ample, oblong-spathulate or obovate-spathulate, 3–4 times longer than wide, mostly rounded at apex; Kauai, Oahu, Hawaii; perhaps also elsewhere. var. *spathulatum* (typical form).
 3. Petioles shorter, somewhat flattened, about 1–2 cm. long.
 4. Leaves usually less than 15 cm. long, spathulate but tapered and acute or even acuminate at apex, tapered at base, pale, rigid, the margins often revolute, the blade usually 3–4 times longer than wide; Oahu. var. *spathulatum*, form b.
 4. Leaves generally 20–50 cm. long or more, relatively broader (about 2–3 times longer than wide), generally rounded or obtuse at both ends, dark; Kauai. var. *spathulatum*, form c.
 2. Leaves pubescent beneath, densely villous at least on the midrib, the laminar surface sometimes glabrescent; blades large, dark, rather broadly spathulate; Kauai, Oahu. var. *pubescens*.
1. Calyx densely cinereous-puberulent; leaf-blades usually somewhat pubescent beneath; Oahu, Maui, Hawaii. var. *pallidum*.

***Platydesma spathulatum* var. *spathulatum*.**

Platydesma campanulatum f. *coriaceum* Rock, Indig. Trees Hawaiian Is. 242. 1913.

Glabrous throughout; petioles slender, elongate, usually 2–6 cm. long; blades ample, oblong-spathulate or obovate-spathulate, usually 3–4 times longer than wide, mostly rounded at apex, often somewhat rounded at base.

Kauai. Hanalei, *Faurie* 241 (A); Makaweli, *Faurie* 246 (A); Waimea, *Faurie* 245 (A, BISH), *Forbes* 911.K. (BISH); Kokee, *Rock*, 1956 (BISH); Kaholua-manu, *Forbes* 328.K. (BISH); *Rock* 1968, 1976, 5338 (GH), 1978, 5344, 5969 (BISH), 6021 (A); Kaunuohua ridge, Kaluapuhi trail, *Wichman* (GB); Kokee Camp, *Degener* 8640 (A); Kokee-Kilohana, *Skottsberg* 981 (BISH, GB); Lehua-makanoe-Kilohana, *Cranwell et al.* HBS. 2938 (BISH, GB); Halemanu, *Rock* 2298 (BISH), 2314 (GH); *Neal*, 1929, 1930 (BISH), *Kusche* (GH); Kumuwela, *Cranwell et al.* HBS. 2841 (BISH, K), 2847 (GB), *Stone* 3360 (BISH, BM, CU, E, GH, P), 3395 (BISH, GB); Awa'awapuhi trail, *Lane* 56–614 (BISH), *Stone* 1609 (BISH, K), 3330 (BISH, P, US); Kohua ridge, *Degeners & Hansen* 23919 (BISH); without locality, *Forbes* (BISH).

Oahu. WAIANAË RANGE: Piko trail, Makua, Mokuleia forest reserve, *Davis*, 1932 (BISH). KOOLAÛ RANGE: Northern end: near summit 1 mi. se. of Black Junction, Kahuku, *Degener & Carroll* 20554 (BM); Kahuku, *Degener* 8624 (A); Punalu'u and vicinity, *Faurie* 242 (A), *Forbes*, 1908, 1909 (BISH); *Rock* 459, 640, 657, 8834 (BISH); *MacDaniels* 382 (BISH), *Hume* 76, 106 (BISH); Kaliuwa'a, *Rock* 65 (BISH); Waipio-Waiawa, *MacDaniels* 16, 53 (BISH); Waiawa, *Anon.*, 1930 (ex Herb. Bd. Comm. Agric. For. Terr. Hawaii) (BISH); Kawaihoa, *Bryan* 867 (BISH); Kahana, *Lyon*, 1926 (BISH); Wahiawa-Kahana, *Forbes* 2202.0. (BISH); back of Wahiawa, *Swezey*, 1920 (BISH); *Budd & Emerson* 1155 (BISH); Waikane-Schofield trail, *St. John* 10161 (BISH); Kipapa gulch trail, *Cowan* 700 (BISH); Anahulu trail, *Degener* 10092 (A). Southern end: Pauoa, *Hillebrand* (BISH); Konahuanui, *Forbes*, 1908 (BISH), *Heller* 2373 (GH), *Mann & Brigham* 94 (CU, type of *Platydesma campanulata*; BISH, GH, K); Mt. Olympus, *Rock* 10225 (BISH, GH), *Forbes* 1637.0. (BISH); Koolau range, without locality, *Hillebrand* 242 (K); *Rock* 134 (GH).

Hawaii. Kohala, *Rock*, 1957 (BISH), *Rock* 8367 (GH); Hualalai (?), *Rock* 3800 (BISH); Ola'a flume, *Forbes* 652.H. (BISH); Ten-Miles, *Fullaway & Gifford*, 1919 (BISH); Glenwood, *Faurie* 244 (A, BISH), *Rock*, 1918 (BISH), 1914 (BISH); Kilauea, *Rock* 12999 (BISH); "Sandwich Isl.," *U. S. Exploring Expedition* (GH).

Platydesma spathulatum var. *spathulatum*, form b. (FIG. 2.)

Shrubby, with slender branches and small, narrowly spathulate, pale, rigid leaves tapered at both ends, the margins often revolute; petiole 1–2 cm. long.

This form is the one most commonly found on the summit crests of the Koolau Range, Oahu, where the vegetation is low, stunted, and windswept.

Oahu. KOOLAÛ RANGE: Punalu'u, summit of Castle trail, *Stone* 3551 (BISH) (see FIG. 2), 1142 (BISH), *Degener, Park & Nitta* 8633 (US); Laie, Malaekahana trail, *Degener et al.* 10093 (CU); ridge above Kahana, *Skottsberg* 1853 (BISH, GB); near summit of Poamoho trail, *Degener* 27328 (US); Punalu'u, *Faurie* 243 (A, BISH); *Rock* 460 (A).

Platydesma spathulatum var. *spathulatum*, form c.

Arborescent, with thick, often rugulose branches and ample leaves up to 50 cm. long, usually 7–25 cm. wide, obtuse at apex and rounded at base, dark green, quite glabrous.

This form appears to be limited to Kauai, where it occurs in the high forested tableland around the rim of Kalalau Valley.

Kauai. Honopu, Awa'awapuhi trail, *Lane* 56–586 (BISH); east rim of Kalalau Valley, *Degener & Cadenheads* 27150 (BISH, GB, K, US).

Platydesma spathulatum var. *pubescens* (Skottsberg) B. C. Stone, *Madroño* 16: 165. 1962.

Platydesma campanulata var. *pubescens* Skottsberg, *Acta Horti Gothob.* 15: 388. 1944.

Arborescent; petioles distinct, up to 5–6 cm. long; blades ample, relatively broad, pubescent beneath (on the lamina sometimes glabrescent, but

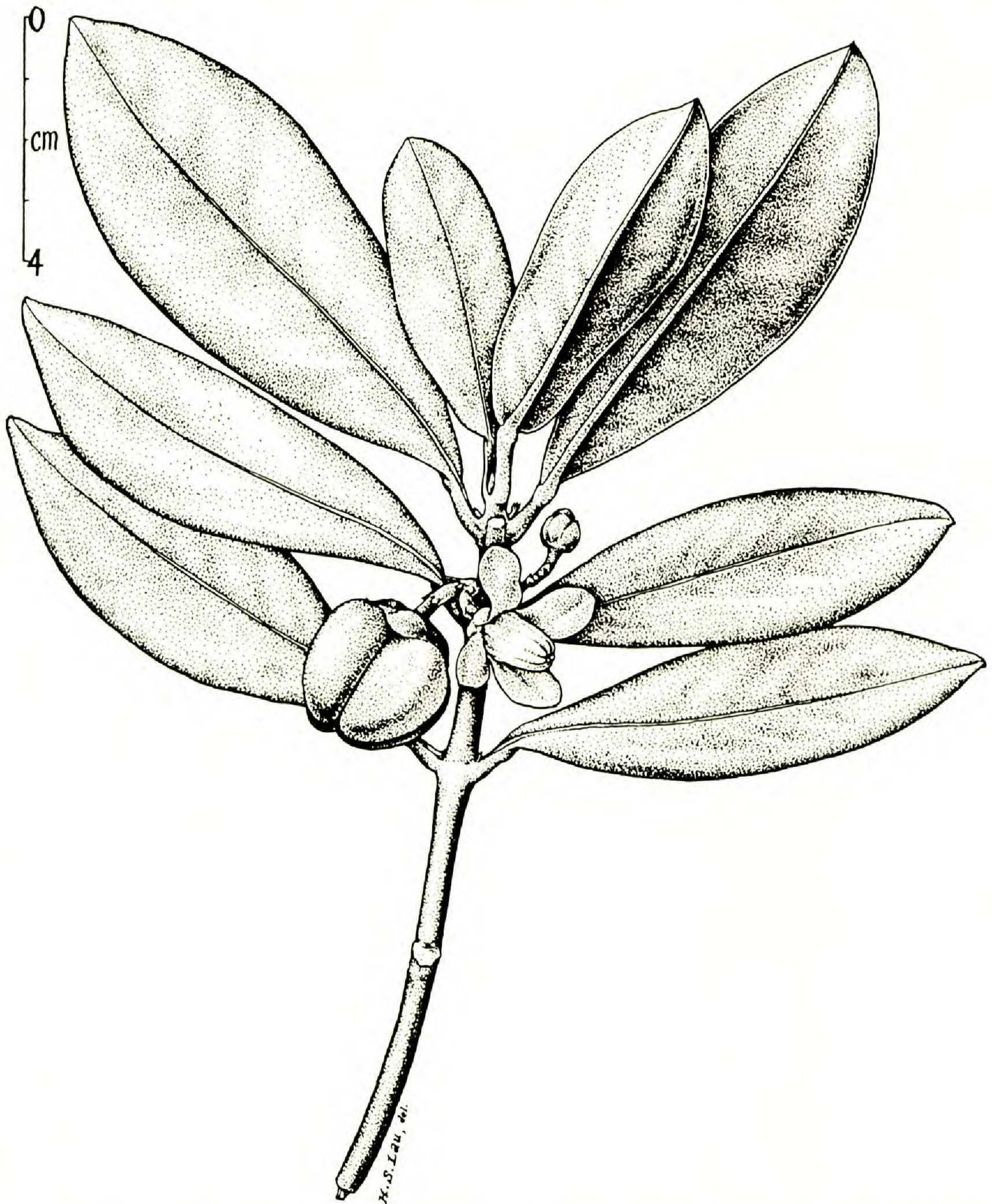


FIG. 2. Habit, with flower and fruit, of *Platydesma spathulatum* var. *spathulatum* form b. (From Punalu'u, Oahu.)

the costa with a persistent villosity), broadly spathulate to subelliptic, dark above (the lower surface paler); calyx glabrous or nearly so.

HOLOTYPE: Oahu: Waianae Mountains, slope of Kaala, *O. Selling 3710* (GB).

Kauai. Wahiawa Mountains, *Forbes 231.K.* (BISH); Waimea drainage basin, west side, *Forbes 782.K.* (BISH); Halemanu, *Rock 2318* (BISH); Kalalau trail, *Forbes 1046.K.* (BISH); Kaholuamanu, *Rock 5339, 10226,* (BISH), *5340* (A); Kumuwela plateau, *Stone 3358* (A, BISH, BM, E, GB); Hanalei-Lihue powerline

trail, *Forbes*, 1909 (BISH); Hanapepe, *Faurie* 240 (A). Oahu. Waianae Mountains, slopes of Kaala, Mokuleia, *Morley*, 1934 (BISH).

Platydesma spathulatum* var. *pallidum (Hillebrand) B. C. Stone, *Madroño* 16: 165. 1962. (FIG. 3.)

Platydesma campanulata β var. *pallida* Hillebrand, *Fl. Hawaiian Is.* 71. 1888.

Similar in most respects to the typical variety, but with densely cinereous-puberulent calyx lobes (sometimes also the outer surfaces and

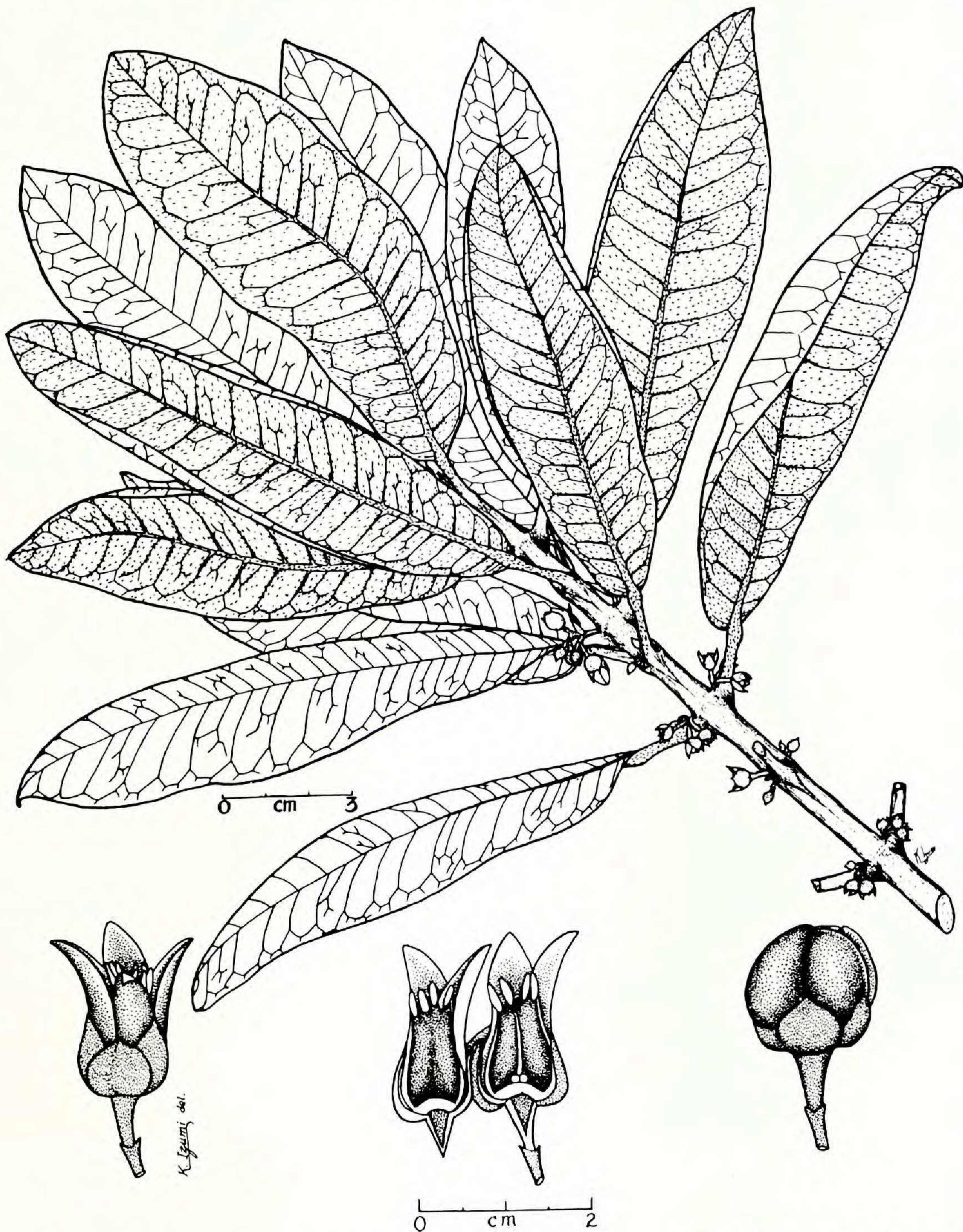


FIG. 3. Habit, flowers, and fruit of *Platydesma spathulatum* var. *pallidum*. (From Olinda, Maui, coll. *Degener*; courtesy of Dr. *Degener*.)

margins copiously ciliolate), the pubescence extending to the mid-region of the petals; leaf blades pubescent beneath; hairs pale or fulvous, erect to somewhat spreading, about 0.2–0.4 mm. long, those on the calyx (and axes of the inflorescence) appressed, those of the leaves more erect.

SYNTYPES: Oahu, Kaala, *Hillebrand*; Maui, Hamakua, *Rev. John Lydgate*; both formerly at Berlin, but destroyed in World War II. NEOTYPE: *Topping (Degener 8615)* (BISH), cited below.

Oahu. WAIANAЕ MOUNTAINS: *Hillebrand*, 1869 (GH); Peahinaia trail, *Degener 12771* (A). KOOLAU RANGE: Pupukea, *Degener, Park & Nitta 8622* (A, NY); Poamoho trail, *Degener et al. 10859* (A). Maui. Woods near Ukulele, above Olinda, *Forbes 205.M.* (BISH); Olinda, *Rock 8534* (BISH, GH); *Topping (Degener 8615)* (BISH, CU, K); Kaea, *Forbes 2552* (BISH); Nahiku, *Forbes 240.M.* (BISH); below Kula pipeline, *Munro 796* (BISH); Kipahulu valley, ridge on left side, *Forbes 1642.M.* (BISH); ridge between west and east Wailuailai, *Forbes 2664.M.* (BISH); Honomanu, east bank of gulch, *Forbes 2658.M.* (BISH); west trail behind Honomanu, *Forbes 2587.M.* (BISH); Honomanu trail, *Rock 10228* (BISH), *Rock*, 1911 (BISH); Kailua, *Rock*, 1908 (BISH); without definite locality other than "East Maui," *Rock*, 1911 (BISH); without locality, *Forbes*, 1920 (BISH). Hawaii. Kohala, Honokanenui, *Rock 8367* (A, BISH); Papaikou near Honomu, *Bryan*, 1937 (BISH).

2. **Platydesma Remyi** (Sherff) Deg., Sherff, & Stone, Fl. Hawaiiensis, fam. 179. 1960. Stone, *Adansonia* II. 1: 98, 99. 1961. (FIG. 4.)

Claoxylon Remyi Sherff, Publ. Field Mus. Bot. 17: 557. 1939.

Claoxylon insigne H. Baillon ex Drake del Castillo, Illustr. Fl. Ins. Mar. Pac. 291. 1892 (*nomen nudum*).

Platydesma campanulatum var. *sessilifolia* Rock, Indig. Trees Hawaiian Is. 243. 1913.

Platydesma auriculaefolia sensu *Hillebrand*, Fl. Hawaiian Is. 72. 1888, not *Pelea auriculaefolia* A. Gray, 1854.

A sparingly branched light-wooded shrub or laxly branched small tree up to 2 or 3 m. tall, with branches loosely foliose and leaves subdistant, opposite; habit similar to that of preceding species; leaves sessile or subsessile, the short obsolete petiole broad, flattened, up to 5 mm. long, sparsely hispidulous; blades obovate or broadly spathulate, elongate, 14–38 cm. long, 4.5–18.5 cm. broad, often about 30 × 12 cm. (2–3 times longer than broad), punctate-glandular, entire, rounded or bluntly obtuse to subacute at apex, narrowed and at last rather abruptly rounded, subtruncate, or even subauriculate at base, glabrous above, sparingly puberulent beneath at least when young, the costa sulcate above and raised beneath; inflorescences axillary, 1–3(–5?)-flowered, on short peduncles and axes, the pedicels up to 2 cm. long, the axes nodose with opposed ovate bracts 1–2 mm. long; flowers as in *Platydesma spathulatum*, but the calyx lobes puberulent on both faces; capsule about 25 mm. in diameter, minutely puberulent, with rounded carpels.

HOLOTYPE: Hawaii. Location unknown, *Jules Remy 604*, 1851–55 (P).

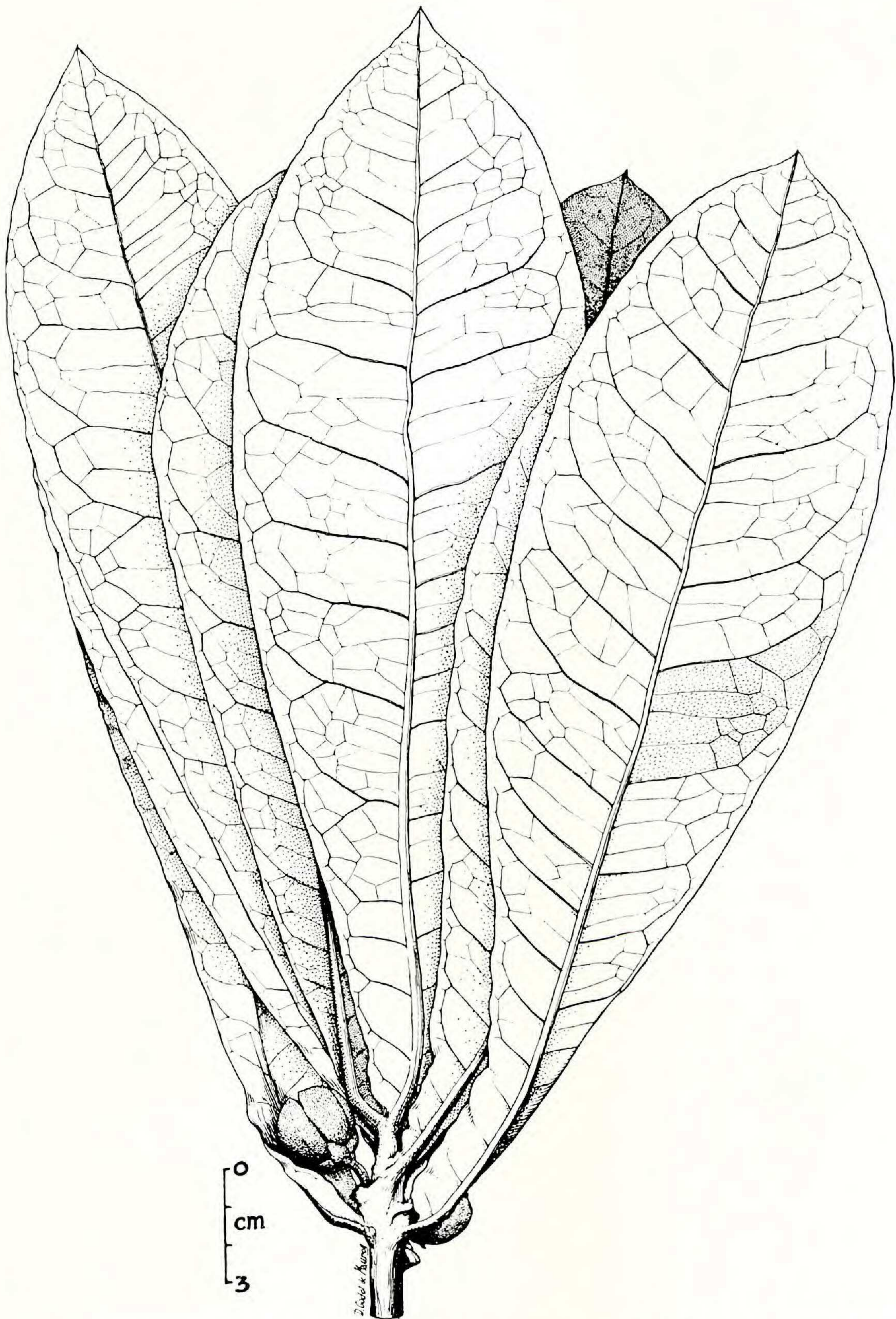


FIG. 4. Holotype of *Platydesma Remyi*. (Illustration by Mme. Godot de Mauroy, commissioned by O. Degener; courtesy Muséum National d'Histoire Naturelle, Paris, and Dr. Degener. Coll. *J. Remy* 604, Hawaii, 1851-55.)

Hawaii. Kohala Mountains, *Hillebrand 244* (GH, K; this collection is the basis of Hillebrand's *Platydesma auriculaefolia*); upper Hamakua ditch trail, above Koiawe valley, *Cranwell & Skottsberg HBS. 3192* (BISH, GB); Kohala, *Forbes 499.H.* (BISH); mauka of Waipio valley (inland side), *Lyon, 1919* (BISH); Kohala, *Rock 8354* (BISH, GH), *4222* (GH, type of var. *sessilifolia*), *Rock, 1912* (A).

This species is very close to *Platydesma spathulatum*, differing mainly in the obsolete petioles, the pubescence of the leaves and calyx (similar to that of *P. spathulatum* var. *pallidum*) and the puberulence of the fruits.

The drawing of the holotype given here (FIG. 4) was made at the request of Dr. Otto Degener, and has been published previously in *Flora Hawaiiensis*.

A specimen from Kauai (Alakai, *MacDaniels 781*) may belong here, but it is fragmentary and somewhat dubious. The locality would not be implausible in relation to the type of habitat, but the wide distributional gap would be most unusual. At present it seems apparent that this species is endemic to the Kohala region of Hawaii. Because of the number and recentness of some collections there seems to be no basis for considering it extinct, but new collections would be desirable. It may be possible eventually to show that this taxon should better be considered as a subspecies of *Platydesma spathulatum*.

Section CORNUTIA, sect. nov.

Carpidii maturitatem divaricati cornuti vel rostrati.

TYPE SPECIES: *Platydesma cornutum* Hillebrand.

3. *Platydesma cornutum* Hillebrand, Fl. Hawaiian Is. 72. 1888. (FIG. 5.)

Melicope grandifolia sensu Wawra, Flora 56: 138. 1873, non A. Gray, Bot. U. S. Explor. Exped. 15: 354. 1854.

Erect unbranched or sparsely branching shrub with soft wood up to 7 m. high, the main stem about 2 cm. diameter, the few branches erect or ascending, closely foliose near the ends, the youngest branches green, soon clothed with a pale grayish bark, the wood when freshly broken having a starchy odor; glabrous throughout except for the leaf buds and the proximal parts of the inflorescences, these sparsely hirtellous, but glabrate; leaves petiolate, petioles short, broad, flattened, 2–10 mm. long; blades glabrous, dark green when mature, linear-spathulate or narrowly obovate, 12–40 cm. long, 5–13 cm. broad, commonly about 30 × 9 cm., tapering gradually to the base, decurrent or finally obtuse, rounded or more commonly bluntly obtuse or acute at apex, the costa sulcate above, prominent beneath, the lateral nerves similar, ascending from the costa, merging distally with the deeply arched connecting vein. Inflorescences axillary, borne among the leaves but maturing on the lower stems after the leaves fall, fasciculately cymose, (3–)9–15-flowered, the peduncle and

axes obsolete, pedicels thus subsessile, bractlets and bracteoles at first hirtellous, pedicels glabrous or nearly so, 5–10 mm. long, flaring into the base of the calyx; sepals glabrous except for the ciliolulate margins, broadly rounded, 3–4 mm. long and 5–6 mm. broad, imbricate in pairs, the inner pair slightly smaller; petals white, glabrous except for the minutely ciliolulate margins, 9–12 mm. long; stamens 8, connate into a staminal tube, the anthers on very short deltoid filaments, unequal, 4 somewhat larger, equalling the corolla, 4 slightly shorter; tube at base very slightly connate with base of corolla; ovary 4-lobed. on an obscurely 8-lobed disk, the styles at first connate, with 4 linear stigmas, later separating as the fruit matures; capsule with thin, chartaceous walls, glabrous, about 12 mm. long, the carpels united along their mutual faces nearly to the apex or free down to the middle, the distal portions divergent, each carpel terminating in a sharply acuminate horn-like tip; carpels usually 8-seeded; seeds with a shining black crustaceous testa.

KEY TO VARIETIES OF PLATYDESMA CORNUTUM

Leaves abruptly truncate or obtuse at base, petiole distinct. var. *cornutum*.
 Leaves tapered and gradually, evenly decurrent at base. var. *decurrens*.

Platydesma cornutum var. *cornutum*.

Leaves tapering toward the base but at last briefly but abruptly truncate or obtuse, the petiole distinct.

HOLOTYPE: Oahu. Without definite locality except "Helemano, Wailupe, and Pauoa" (Koolau Range), *Hillebrand* (K; isotype, GH).

Oahu. KOOLAU RANGE: Northern end: Pupukea, *Skottsberg 1815* (BISH, GB); Pupukea-Malaekahana, *Lyon, 1926* (BISH); south Opa'eula gulch, Pa'ala'a, *St. John 10642* (A, BISH); Pupukea-Kahuku, *Degener 8623* (A, CU); Paumalu, *Hosaka 123* (BISH); Punalu'u, *Rock 8833* (BISH), *Rock and Forbes, 1908* (A), *Rock, 1908* (GH), *Anon., 1908* (Herb. Bd. Agric. For. Terr. Hawaii) (BISH); between Kaipapau and Punalu'u, *Forbes, 1908* (BISH); Kaluanui, summit and beyond, Castle trail, Punalu'u, *Webster 1610* (BISH); Wahiawa gulches, *Forbes 1712.0.* (BISH); southern end, Puu Konahuanui, *Forbes 1010.0* (BISH); head of Manoa valley, *Rock & Shaw, 1912* (BISH).

The typical variety, easily distinguished by the leaf characters noted, appears to occur only in the Koolau Range, the main eastern chain of mountains of Oahu. There does appear, however, to be some contact between the varieties, since var. *decurrens*, though mostly restricted to the Waianae mountains, has been found once or twice on the western slopes of the Koolau Range nearest the Waianae mountains. It is here that intermediate forms, if any are to be found, could be expected to occur.

Platydesma cornutum var. *decurrens*, var. nov.

Folia longe spathulata, base attenuata laminis in petiolam decurrens.

HOLOTYPE: Oahu. Waianae Range, Pu'u Kanehoa, southeastern side,

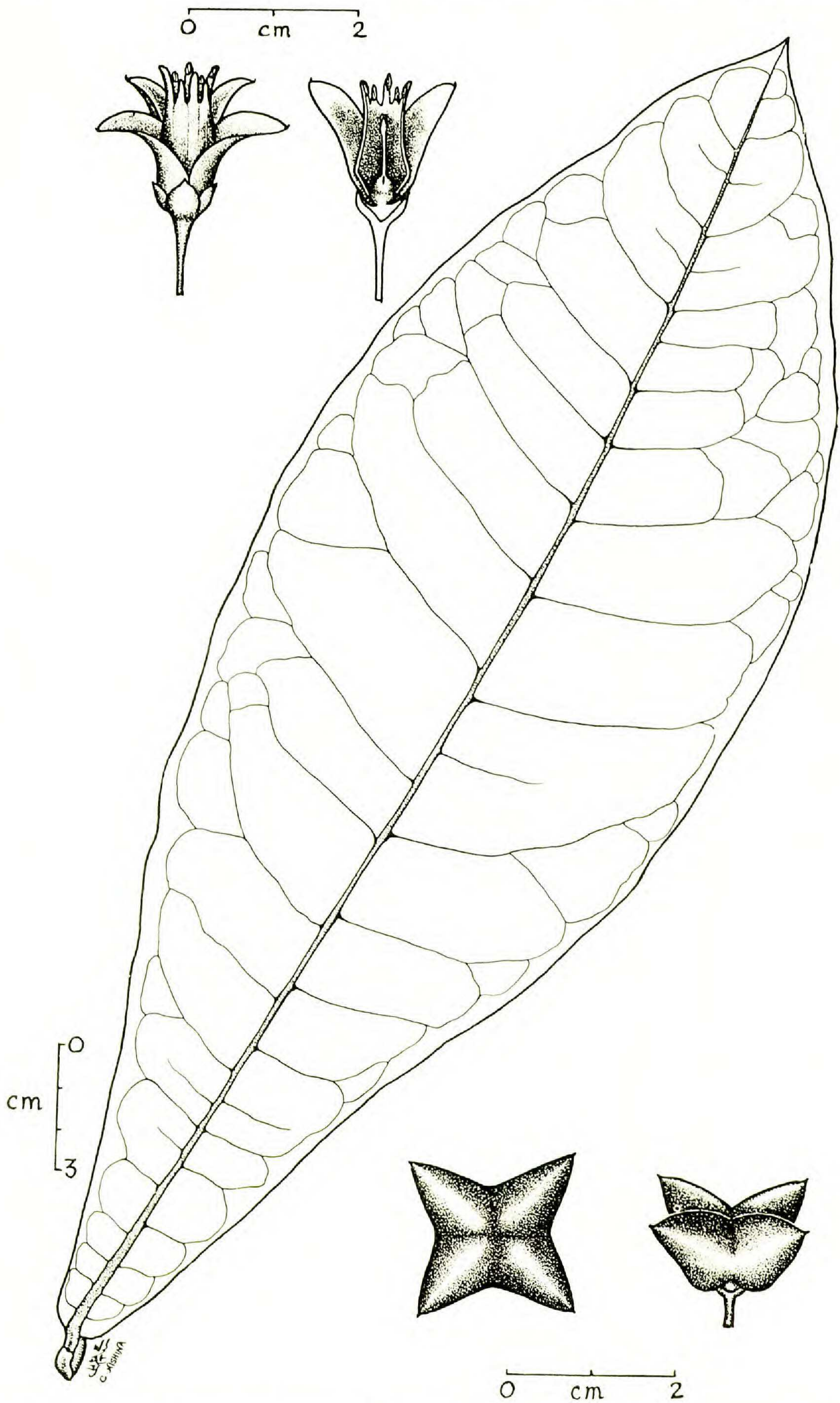


FIG. 5. Leaf, flower, and fruit of *Platydesma cornutum* var. *cornutum*. (From Punalu'u, Oahu; courtesy of Dr. Degener.)

on steep moist banks of stream in valley about 200 m. below summit at altitude of about 700 m., March 26, 1960, *B. C. Stone & G. Pearsall 3263* (BISH).

Oahu. Makaha valley, ridges of Mt. Kaala, *Forbes*, 1909 (BISH); Mokuleia valley, *Forbes 1822.0.* (BISH); Pahole gulch in Mokuleia, *Degener & Hatheway 20664* (BM); Makaleha valley, *Russ*, 1929 (BISH); valley south-east of trail to Pu'u Kanehoa, type locality, *Stone 3430* (BISH, US); Mt. Kaala, *Degener, Park, Topping & Swezey 8631* (A).

This variety is still another of the many examples of taxa endemic to the Waianae mountain range of western Oahu. This range, which is geologically much older than the larger Koolau Range, may be about the age of the island of Kauai. Several examples are known of taxa restricted to Kauai and to the Waianae Mountains, as well as species with distinct varieties in the Waianae Mountains and in Kauai. The specimens cited above are mostly sterile or in flower, but *Forbes*, 1909, bears an immature fruit. There are no apparent differences in floral or fruit characters between the two varieties, but the difference in the leaves is both obvious and constant. The holotype and *Stone 3430* are both from the same location, where a small group of these tall, erect, unbranched shrubs was growing in a moist, rocky habitat near a stream, in company with species of *Urera*, *Touchardia*, *Cyrtandra*, *Alectryon*, *Straussia*, *Morinda*, *Pelea*, and *Athyrium*. The flowers, like those of the next species, *Platydesma rostratum*, are borne on the slender trunks and mature at some distance below the leaves. The sepals are green, the petals and staminal tube clear white.

4. *Platydesma rostratum* Hillebrand, Fl. Hawaiian Is. 72. 1888. (FIG. 6.)

Erect unbranched or sparsely branching shrub with soft wood, branches ascending, juvenile stems green, later clothed in thin, pale, grayish bark, trunks to one or two (or more) meters high, 1–2 cm. thick, freshly broken wood with a starchy odor; leaves clustered near the ends of the branches, opposite, subsessile or with short, flattened petioles about 3–18 mm. long; blades linear-oblong or long, narrowly elliptic to subspathulate, mostly 20–40 cm. long, and 4–12 cm. broad at maturity, usually about 33×7 cm., at base broadly and abruptly truncate or obtuse (rarely subcordate), scarcely or not attenuate, at apex bluntly acute to coarsely acuminate (the tip bluntly acute) or somewhat rounded, in bud hirtellous but soon glabrate, glabrous at maturity; costa sulcate above, raised beneath, the lateral nerves numerous, subopposite or subalternate, almost at right angles to the costa, united distally 3–10 mm. from the margin by a deeply and symmetrically arching connecting vein; inflorescences axillary, at first hidden among the leaves, maturing below the leaves on defoliate young branches, cymose, the cymes 3–9-flowered (and sometimes fasciculate, two or three together), less than 2 cm. long overall, the peduncle stout, 1–3 mm. long

and 1–1.3 mm. broad, the axes and pedicels up to 9 mm. long, the pedicels with an opposed pair of bractlets near the flaring apex at base of calyx, the axes with 1–3 pairs of decussate bractlets, these, with the bracteoles, axes, and peduncle, hirtellous when young, soon glabrescent; calyx slightly puberulent, the lobes imbricate in pairs, the outer pair larger, each lobe about 3 mm. long and 5 mm. wide, the inner pair with each lobe slightly smaller; petals clear white, glabrous, oblong, obtusely rounded at apex, about 5-nerved, valvate, about 12–13 mm. long and 5 mm. broad; stamens united into a staminal tube about 11 mm. long, anthers on brief deltoid filaments, these alternating in size, 4 about 2.5 mm. long, 4 about 2 mm. long, versatile, the anther affixed in the middle of the dorsal side; ovary 4-lobed, on a disk about 5 mm. broad, the carpels free distally, about 1.8 mm. high, subconic and shortly attenuate into a brief style; capsule of 4 carpels, each with a distal rostrum about 8 mm. long, connate nearly their whole length but the beaks free; capsule about 4 mm. long, excluding beaks; carpels 8-seeded; seeds black with a shining crustaceous testa.

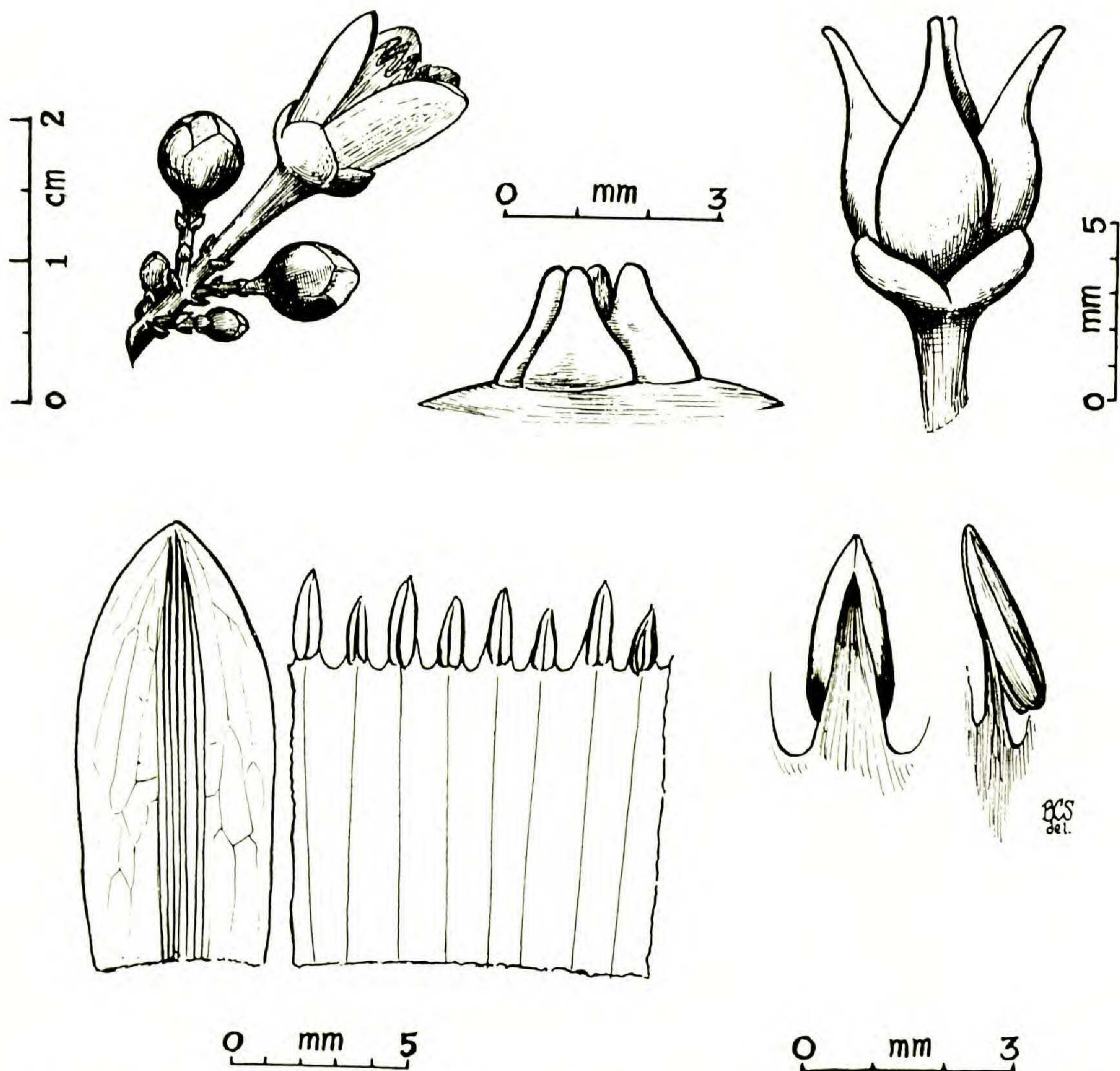


FIG. 6. Floral details of *Platydesma rostratum*. (Three upper figures from Skottsberg 3100, Kauai. Petals and stamens from Rock 6081. Original.)

HOLOTYPE: Kauai, without locality, *Knudsen 68* (Berlin, probably destroyed).

Kauai. Waimea, Kokee-Kalalau trail, *Cranwell, Selling & Skottsberg HBS. 3100* (BISH, GB); Kaunuohua ridge, Kaluapuhi trail, *Wichman (Skottsberg 2937)* (GB); Halemanu, *Rock 2000, 1999 (A), 2323, 6081, 6084* (GH); Awa'awapuhi trail, *Stone 1599* (BISH, K, US); *Lane, 1956* (BISH); *Pearsall, 1956* (BISH); *Stone 3329* (BISH); Hanalei valley, *Forbes 133.K.* (BISH); upper Lihue ditch trail, *MacDaniels 837* (BISH); without locality or date, *Rock 17302 (A)*.

This species is to be found in the mesic to wet forests of the high plateau region of Kauai, where it is well distributed but not common. The leaves are usually rather dark green and glossy above, the flowers clear white. The small, erect, sparingly branched shrubs form an understory element in rain-forest associations.

The relationship of the species is clearly with *Platydesma cornutum*, but the two are easily distinguished by both vegetative and fruit characters. If (as seems probable) evolutionary divergence closely followed the sequence of island formation, this species may antedate *P. cornutum*; or the two may be derived from a common ancestor. The relationship of these species to the arborescent, globose-fruited *P. spathulatum* and *P. Remyi* is obvious, but not particularly close, despite the small size (in number of species) of the genus.

LITERATURE CITED

- DEGENER, O. Flora Hawaiiensis. Unpaged. Privately printed. Honolulu. 1960—.
- DRAKE DEL CASTILLO, E. Illustrationes florae insularum maris Pacifici. Paris. 1890–1892.
- GRAY, A. Botany: Phanerogamia. United States Exploring Expedition . . . under Charles Wilkes . . . 1: 1–777. (Cf. pp. 352–354) 1854.
- HILLEBRAND, W. Flora of the Hawaiian Islands. 1–673. Heidelberg, London, and New York. 1888.
- LÉVEILLÉ, H. *Platydesma oahuensis* and *P. Fauriei*. Repert. Sp. Nov. 10: 153–154. 1911.
- MANN, H., JR. Revision of *Schiedea* and the Hawaiian Rutaceae. Proc. Boston Soc. Nat. Hist. 10: 317. 1866.
- . *Alsinidendron, Platydesma, and Brighamia*. Mem. Boston Soc. Nat. Hist. 1: 529–531. 1869.
- ROCK, J. F. The indigenous trees of the Hawaiian Islands. 1–518. Privately printed. Honolulu. 1913.
- . Revisio plantarum Hawaiiensium a Léveillé descriptarum. Repert. Sp. Nov. 13: 352–361. 1914.
- . *Pelea* and *Platydesma*. Bot. Gaz. 65: 261–267. 1918.
- STONE, B. C. Studies in the Hawaiian Rutaceae III. On the New Caledonian species of *Pelea* and a misunderstood species of *Platydesma*. Adansonia 1: 94–99. 1961.
- . Taxonomic and nomenclatural notes on *Platydesma* (Hawaii) and a new name for a *Melicope* (Solomon Islands). Madroño 16: 161–166. 1962.
- WAWRA, H. Beiträge z. Flora d. Hawaiischen Inseln. Flora 56: 138. 1873.

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